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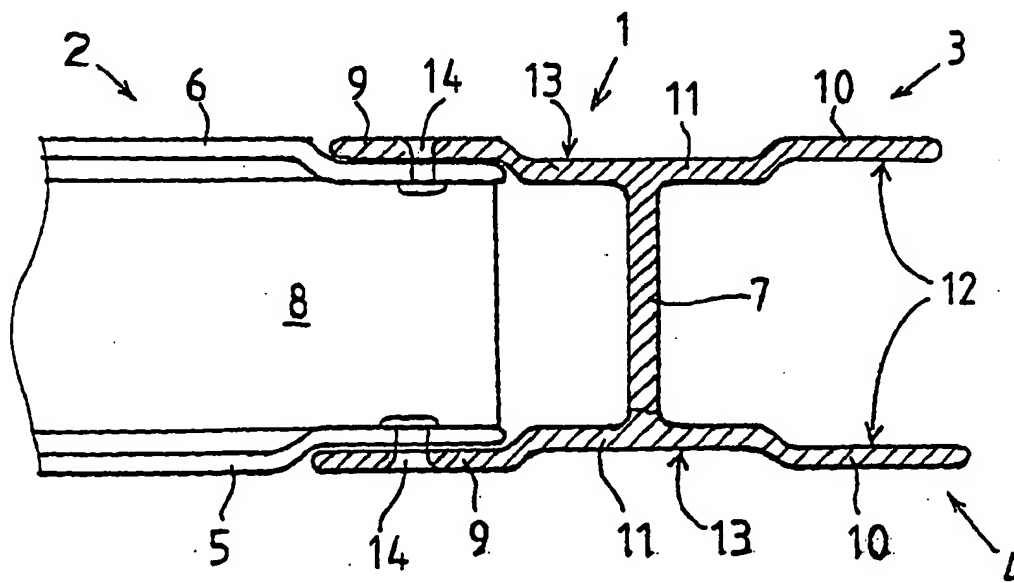
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<p>(21) International Application Number: PCT/FI95/00037</p> <p>(22) International Filing Date: 25 January 1995 (25.01.95)</p> <p>(30) Priority Data: 940367 25 January 1994 (25.01.94) FI</p> <p>(71) Applicant (for all designated States except US): OY SAAB-VALMET AB [FI/FI]; P1 Box 4, FIN-23501 Uusikaupunki (FI).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): FORSMAN, Tom [FI/FI]; Koutuntie 15, FIN-21570 Sauvo (FI).</p> <p>(74) Agent: PAPULA REIN LAHTELA OY; P.O. Box 981, Fredrikinkatu 61A, FIN-00101 Helsinki (FI).</p>	<p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. In English translation (filed in Finnish).</p>	

(54) Title: BODY STRUCTURE



(57) Abstract

A frame structure, composed of I beams (1, 2) joined together, each having two flanges (3, 4, 5, 6) and between them a web (7, 8). Both flanges of the I beam comprise two joining parts (9, 10) and a connecting part (11) between them, on which the web abuts. The inner surfaces (12) of the opposing joining parts are at substantially equal distance from each other as the outer surfaces (13) of the connecting parts. Hereby in the frame structure two I beams can be joined to each other by rendering the joining parts on the end of one beam flush with the connecting part and inserting the end of the beam between the joining parts of the other beam, for joining the beams.

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## BODY STRUCTURE.

The present invention concerns a frame structure as defined in the preamble to Claim 1. The frame structure can be used in various applications, such as e.g. vehicles, building technology and interior decoration, and in shipbuilding.

Metallic frame structures for use in various applications are traditionally made of I beams, U beams or square tubes, which are usually welded together to form a latticed structure with a spacing as required by the strength and rigidity which one desires to achieve.

In numerous applications, a significant characteristic of the frame structure, in view of overlaying and coating, is the evenness of its surface. This often implies, when beams, rails and tubes of prior art are used, necessity of cutting the end of a piece to be joined to suitable shape in order to fit it to the side of the mating piece. For instance, on an I beam the flanges are cut off so that the web can be inserted between the flanges of another I beam. Such joints are cumbersome and slow in implementation, and they cause extra costs in the manufacturing process.

The object of the invention is to eliminate these drawbacks. Specifically, the object of the invention is to present a novel frame structure which enables convenient and fast manufacturing of a frame structure and by which one obtains in a simple way, a frame structure with even surfaces, on which it is easy to fix, e.g. to cement, various surface materials, such as sheets on a metal or wood base.

Regarding the features characterizing the invention, reference is made to the Claims section.

The frame structure of the invention is composed of I beams connected to each other, these I beams consisting of two flanges and one web connecting

these. As taught by the invention, both flanges of the I beams used comprise two joining parts and one connecting part therebetween, the web resting on the latter. These planar joining parts and connecting parts  
5 are so dimensioned and shaped that the inner surfaces of the opposed joining parts of the I beam are at a distance from each other which is substantially equal to that between the outer surfaces of the connecting parts.

10 When this is the case, in manufacturing a frame structure in the way taught by the invention two I beams can be joined at an angle against each other by first rendering on one end of one beam the joining parts flush with the connecting part on both flanges  
15 and, thereafter, inserting the end of the I beam between the joining parts of the other I beam for joining the I beams.

Joining of the I beams may be effected with the aid of rivets, bolts, screws or, depending on the material of the I beams, also by welding. In a frame  
20 structure according to the invention the joined I beams are advantageously at right angles, but their joining to each other is equally possible at an oblique angle.

25 In an advantageous embodiment of the invention the I beams are made of extruded aluminium section.

In an advantageous embodiment of the invention the end of the I beam is pressed, or squeezed, so that the outer surfaces of the joining parts come to  
30 lie flush with the outer surfaces of the connecting parts, whereby the end of the I beam can be inserted between the joining parts of another similar I beam.

The frame structure of the invention is advantageously made by connecting together the requisite  
35 number of I beams according to the invention, at right angles against each other, so that a strong

enough and rigid enough lattice structure is obtained which is substantially even on both sides, thus constituting a good mounting site for various kinds of surface sheet.

5 Other advantages of the invention, and various alternative structural designs, will become apparent from the description following below, in which the invention is described in detail in the attached drawing, wherein:-

10 Fig. 1 presents an I beam for use in a frame structure according to the invention, and  
Fig. 2 presents the joint between two I beams in a frame structure according to the invention.

15 The I beam used in the invention comprises two flanges 3 and 4, parallel with each other, and a web 7 connecting them and located perpendicularly between them.

Both flanges 3 and 4 are in their breadth direction divided into three planar parts: two joining parts 9 and 10 on the margins, and a connecting part 11 between them. In the present embodiment, the joining parts and the connecting part are equal in width, i.e., the surface of the I beam is divided into three parts of substantially equal width. The joining parts 20 9 and 10 are coplanar, and the connecting part 11 constitutes a recess, or an upper surface lower down and closer to the web, between the joining parts, compared with the upper surface of the joining parts.

25 In other words, the inner surfaces 12 of the opposed joining parts 9, respectively 10, of the flanges 3 and 4 have a distance from each other which substantially equals that of the outer surfaces 13 of the connecting parts.

30 The frame structure of the invention is manufactured, as shown in Fig. 2, as follows. The end of one I beam 2 intended to be joined to another I beam 1 is pressed, or by another appropriate means rendered  
35

uniform in thickness, i.e., the joining parts on the ends of both flanges 5 and 6 are bent so that the outer surfaces of the joining parts will be flush with the outer surfaces of the connecting parts. Hereby the end of the I beam 2 will be smooth on either side of the web 8, and the end of the I beam will be uniform over its entire breadth. It follows that the distance from each other of the outer surfaces of flanges 5 and 6 is substantially consistent with the distance between the inner surfaces 12 of the joining parts 9 of the other I beam's 1 flanges 3 and 4.

Hereby, when the end of the I beam 2 has been sawed, or in any other way cut off, at right angles, it can be inserted at right angles between the joining parts 9 of the I beam 1 and the joining parts of both I beams can be joined e.g. by means of rivets 14, as shown in Fig. 2.

When making right-angled joints, one need not make any extra cuts, or other material removing, on the end of the I beam which is going to be joined: the I beam which has been cut straight across is merely pressed to appropriate shape. Similarly, when oblique angles are produced in the frame structure of the invention, the end of the I beam is merely cut off at the oblique angle one desires to make, and it is pressed into shape to be ready for installation.

In the foregoing, the invention has been described in detail with the aid of the drawing, while different embodiments of the invention are feasible within the scope of the inventive idea delimited by the claims.

## CLAIMS

1. A frame structure, composed of I beams (1,2) joined together and comprising a first I beam (1) and a second I beam (2), each having two flanges (3,4,5,6) and between them a web (7,8), and which I beams have been joined to each other so that the end of the second I beam (2) lies between the flanges of the first I beam (1), characterized in that the flanges (3,4,5,6) of the I beam (1,2) comprise two joining parts (9; 10) and a connecting part (11) between them, on which the web (7,8) abuts; and that the inner surfaces (12) of the opposing joining parts (9,9; 10,10) are at substantially equal distance from each other to that of the outer surfaces (13) of the connecting parts (11); and that for joining together the first I beam (1) and the second I beam (2) in the region adjacent to the end of the second I beam (2) the upper surface of the joining parts (9; 10) has been rendered substantially flush with the outer surface (13) of the connecting part (11) so that the end of the second I beam (2), shaped in the way described, can be inserted between the joining parts (9,9; 10,10) of the first I beam (1).

2. Frame structure according to claim 1, characterized in that the I beams (1,2) are made of extruded aluminium section.

3. Frame structure according to claim 1 or 2, characterized in that the end of the I beam (1,2) is squeezed or pressed so as to fit in between the joining parts of the other beam.

4. Frame structure according to any one of claims 1-3, characterized in that the I beams (1,2) are joined by rivets, bolts or screws.

5. Frame structure according to any one of claims 1-4, characterized in that a plurality of I beams have been joined together at right angles or at

oblique angles to form a frame structure which is substantially smooth on both sides.

6. The use of a frame structure according to any one of claims 1-5 in vehicles, in building technology, in interior decoration and/or in shipbuilding.
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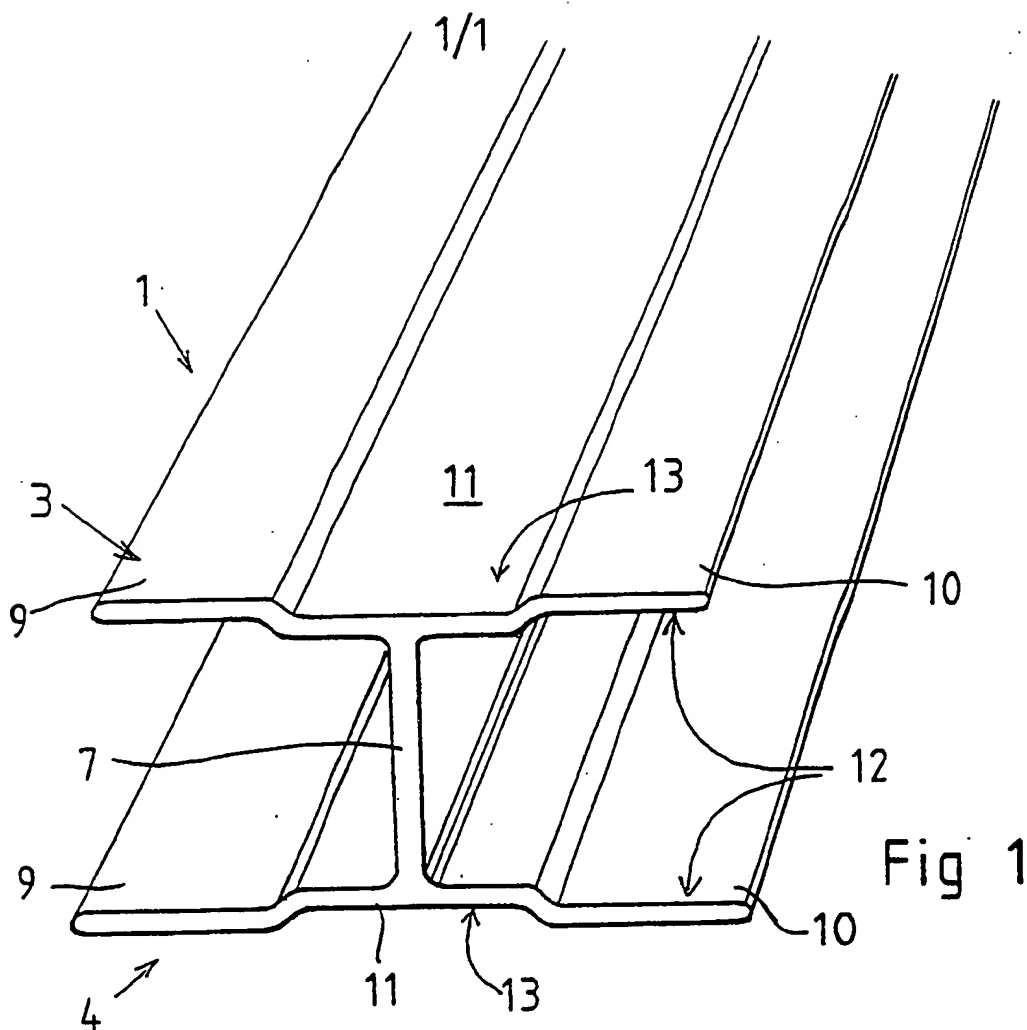


Fig 1

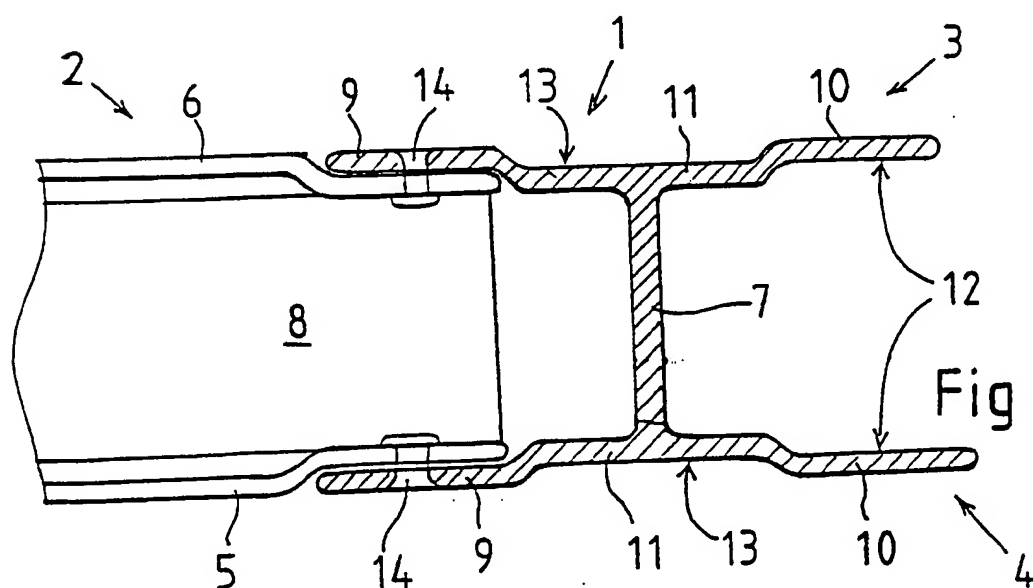


Fig 2

SUBSTITUTE SHEET

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 95/00037

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E04C 3/06, E04B 1/24, E04B 1/58

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E04B, E04C, E04G, F16S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 2942566 (ALUMA SYSTEMS INC.), 12 March 1981 (12.03.81), page 7, line 20 - page 8, line 7, figures 1,2 --	1-6
A	US, A, 4246737 (N.C. EILOART ET AL), 27 January 1981 (27.01.81), column 2, line 59 - line 64, figures 1,2 --	1-6
A	US, A, 2457129 (J.K. COLLINGS), 28 December 1948 (28.12.48), column 2, line 16 - line 32, figures 1, 2 --	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3628300 (N. TSURUMI), 21 December 1971 (21.12.71), column 3, line 71 - column 4, line 18, figures 13,14  --	1-6
A	DE, C2, 2644040 (SLOWBE, J.A.), 20 January 1983 (20.01.83), column 4, line 2 - column 5, line 1, figures 1-3  -- -----	1-6

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 2942566	12/03/81	AU-B- 522430 AU-A- 5227179 CA-A- 1106127 FR-A,B- 2461071 GB-A- 2054691 JP-C- 1297249 JP-A- 56012451 JP-B- 60016545 SE-A- 7908294	03/06/82 15/01/81 04/08/81 30/01/81 18/02/81 20/01/86 06/02/81 26/04/85 07/01/81
US-A- 4246737	27/01/81	NONE	
US-A- 2457129	28/12/48	NONE	
US-A- 3628300	21/12/71	DE-A- 2117342 DE-A,B,C 2120340 FR-A,B- 2092094	04/11/71 02/12/71 21/01/72
DE-C2- 2644040	20/01/83	NONE	

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